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AUTHOR MacCorquodale, Patricia
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ABSTRACT

The accomplishments of Mexican American students have been limited by the level of education completed and by concentration in particular occupations. As part of a larger research project concerning this problem, 259 eighth grade students from Tucson were compared on the basis of sex and ethnicity, with a focus on attitudes toward science. No significant sex or ethnic differences were found in attitudes toward science courses or in social encouragement and expectations. In response to questions on the link between school and future work, Anglo females and Mexican American males perceived science as most important. Mexican American girls rated science as less important for understanding the world than Anglo girls did. In answer to questions about sex roles, girls within each ethnic group were more nontraditional than boys; responses of Mexican American and Anglo boys were not significantly different. Few girls considered science and career education as more appropriate for boys. Implications drawn from the study were: minority students need better preparation in basic skills; students need to be encouraged to take math and science courses; changes in curriculum may be necessary; better career counseling is necessary; and sex-typing of science, math, and careers in general needs to be addressed. (AN)

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Psycho-Social Influences on the Accomplishments of Mexican-American Students*

Patricia MacCorquodale, Ph.D.**

Department of Sociology
University of Arizona
Tucson, AZ 85721

The accomplishments of Mexican-American students are limited by two factors. First, the amount of education completed by Mexican Americans is low compared to other groups in the United States. The median education of Mexican Americans in 1976 was 9.6 years while the median education for the total population was 12 years (U.S. Bureau of the Census, 1977). Similarly, 32 percent of all Mexican Americans in 1976 were high school graduates while 64 percent of the total U.S. population had graduated from high school. The difference between Mexican Americans and the total population is smallest among recent cohorts indicating that the relative position of Mexican Americans has improved. Even with this improvement, however, compared to other hispanics and other ethnic groups (e.g. blacks, Native Americans, Asian Americans), Mexican Americans rank lowest in median education and second lowest in percentage of high school graduates (Almquist and Wehrle-Einhorn, 1978).

Second, hispanics are concentrated in particular occupations both in terms of training and employment. Mexican Americans are overrepresented as service workers, operatives, and farm laborers and underrepresented as professionals, managers and sales workers (U. S. Bureau

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of the Census, 1977). Even within the professions, hispanics specialize in particular fields such as education, foreign language, public affairs, area studies and social sciences (National Science Foundation, 1980). Mexican Americans, like other minorities, are particularly underrepresented in science. In 1974, only 5 percent of all employed scientists and engineers in the United States were members of racial minority groups. While Mexican Americans comprise 2.5 percent of the population, a mere .001 percent of all scientists and engineers are Mexican American ("Women and Minorities in Science and Engineering," 1977). In response to this situation, both the National Institute of Education and the National Science Foundation are supporting research, programs, and workshops which are designed to encourage greater participation of minorities and women in science.

The level of education completed and occupational specialization have consequences for the employment options, income and possibilities for promotion of Mexican Americans. The concentration of Mexican Americans in a small number of occupations also may influence the aspirations of today's students. The paucity of role models in the professional and technical occupations may limit the range of aspirations of adolescents. Thus, while students may have higher aspirations than their parents, the concentration of Mexican Americans in particular occupations may continue (Heller, 1967).

Numerous explanations of the educational and occupational attainment of Mexican Americans have been made. Recent studies however, have often contradicted these explanations, which may reflect cultural stereotypes more than accurate representations. One explanation which is frequently

offered is that Mexican American students have lower aspirations and expend less effort in school when compared to other students. The available research indicates, however, that the problem is in realizing aspirations not in setting goals; the educational aspirations and effort expended in school do not differ for Mexican Americans (Anderson and Johnson, 1971; Espinoza, Fernandez and Dornbusch, 1977; Juarez and Kuvlesky, 1969).

A second explanation proposes that Mexican Americans have less ability in school related skills than other students. Studies which have compared Mexican Americans to other students have found that Mexican Americans, like black students, have lower achievement test scores and get lower grades than Anglos (Anderson and Johnson, 1971; Espinoza, Fernandez and Dornbusch, 1977). Poorer preparation in basic skills obviously influences the students' ability to reach their educational and occupational goals. The question is why are Mexican-American students poorly prepared.

Language may be a barrier insofar as the students have limited skills in English. The bilingual program in many school districts are attempts to decrease the language barrier. As of 1972, however, bilingual programs reached only 2.7 percent of the Mexican-Americans in the Southwest (U. S. Civil Rights Commission, 1972). Insofar as some subject matter is offered on a bilingual basis and others are not, the availability of bilingual courses may influence the specialization of interests of those students reached. Language alone is not an adequate explanation for two reasons. First, skill in English does not account for the relatively high educational attainment of Asian Americans nor the relatively low attainment of blacks. Second, language cannot account for the differences between

hispanics, in particular the lower attainment of Mexican Americans compared to Cubans, Puerto Ricans and other Spanish speaking groups.

A related explanation is that Mexican Americans, because of their language and culture, develop cognitive styles that are poorly suited to certain subject matter. This explanation is based on the assumption that particular cognitive styles, e.g., rational, logical, field independent, are better than others. It is interesting that these same cognitive differences have been used to account for women's lack of participation in science and math. Research, however, has demonstrated that many of these skills, such as field independence, are learned and can be modified by short-term programs (Kersh and Cook, 1979). More importantly, recent studies have suggested that a bilingual, bicultural heritage is an advantage rather than a barrier. Ramirez (1977) presents evidence that bicultural students may have greater flexibility in their personal and cognitive styles and hence may be better able to respond to the complex, changing environment than those raised in one culture.

Several explanations focus on the Mexican-American family. It has been suggested that education and achievement are less important in Mexican-American families compared to other families. The available research contradicts this view by finding no difference between Anglo and Mexican-American students' perceptions of their parents' views of the importance of education (Anderson and Johnson, 1971; Espinoza, Fernandez, and Dornbusch, 1977).

Sex roles within the family have been used to predict that the attainment of women will be restricted more than that of men. In contrast to what one would expect, the sex difference in educational

attainment is small; Mexican-American women complete nearly as much education as Mexican American men (U. S. Bureau of the Census, 1977). The differences that exist are due to the fact that more Mexican-American men are three times more likely to graduate from college than Mexican-American women although the rate is very low for both sexes. The relative equality of educational attainment, however, may not continue. If the trend toward increasing post-high school education for Mexican-American men continues, the relative position of Mexican-American women will decline.

Sex role expectations may contribute to the concentration of Mexican-American women in particular fields. Mexican-American women are over-represented in service workers, operatives, and private household workers (U.S. Bureau of the Census, 1977). Except for operative work, these occupations have been predominantly female. Thus, changes in the occupational structure of Mexican-American women may be more difficult than those of Mexican-American men because sex role expectations for women continue to prescribe work in particular occupations but not in others. Thus, there may be two barriers to participation in male dominated fields, such as science: ethnicity and sex.

Finally, students' perception of the relationship between education and their adult lives are related to educational attainment and specialization. Espinoza, Fernandez and Dornbusch (1977) found that Chicanos, like other ethnic groups, believed school was more important and expended more effort when school was seen as linked to their future jobs. They concluded that Mexican-American students were hampered in realizing their goals by poor preparation in verbal and mathematical skills. Role modeling may also be important in that the specific jobs Mexican-Americans

expect to have may be influenced by the present occupational structure. Insofar as text, curricular materials, and the media focus almost exclusively on the majority culture, minority students are limited to role models they actually know. Minority students, thus, may have knowledge of a narrower range of occupations than anglo students do.

Having reviewed the evidence supporting or refuting various explanations of the educational attainment of Mexican Americans, we will now present preliminary results of a research project in Arizona. This research focuses on social influences, in particular, the students' perceptions of the support, encouragement, and expectations of parents, teachers, counselors, peers, and society. Questionnaires were administered to 839 junior high and 1625 high school students and 100 teachers and counselors and 300 parents were interviewed. The following analyses, based on the responses of 259 eighth grade students from Tucson, focus on attitudes toward science.[1] Science is of particular interest because it is a field in which Mexican Americans are especially underrepresented but which is highly regarded in our society.

Students were compared on the basis of sex and ethnicity in order to determine if their responses to four sets of questions differed. Firts, we asked students about their attitudes toward science courses. Students were asked how hard they tried to do better in science when they found they were not learning the subject. There were no differences by sex or ethnicity; about half of the students said they tried

1 39 percent of these students identified themselves as white or Anglo, 49 percent Mexican or Mexican American, and the remaining 12 percent Native American, black, Asian American or a combination of ethnicities. The results presented compare the responses of the Anglo and Mexican-American students.

a great deal to do better.[2] Thus, Mexican Americans do not differ from other students in self assessed effort in science. Next, students were asked whether they would take a course in science if they had a choice. As can be seen in Table 1, about half of the eighth graders would take science if they had a choice and another quarter probably would. The differences by sex and ethnicity are not significant. It should be noted that self selection has already begun to effect the courses students take and hence their subsequent occupational options. In junior high, students take one year or less of science. Only one year of a laboratory science is required. Many students stop taking math and science after they have completed the requirements. Our results show that as early as junior high, some students develop the attitude that science is optional, perhaps without being aware of the effect of this decision on their educational and occupational choices.

Second, students were asked a series of questions about social encouragement and expectations. They were asked how important learning science was to their mothers, their fathers, and their friends. The differences between the groups by sex and ethnicity were insignificant; about two-thirds believed that learning science was very important to their fathers and mothers. On the other hand, half to three-quarters agreed that it was of slight or no importance to their friends. Next, students were asked how much encouragement they received from their mothers, fathers, counselors and friends to do well in science. The pattern of responses was similar to the importance questions and did not differ by ethnicity and sex. Parents were perceived as very

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[2] x^2 tests were used to test for significance.

encouraging by more than half. Friends were seen as not at all encouraging. The reactions to counselor varied considerably. A third believed that counselors encouraged them a great deal; another third believed counselors did not encourage them at all. The results, however, support other research in showing that Mexican Americans do not receive less support and encouragement from parents, friends, and counselors than Anglos do.

The third set of questions focus on the link between school and future work. We asked students how important science was in terms of the work they expected to do, understanding the world, and making decision when buying products. As can be seen in Table 2, anglo females and Mexican-American males perceived science as most important. Mexican-American girls rated science as less important for understanding the world than Anglo girls did. Mexican-American boys thought science was more important when buying products than Anglo boys did. The results suggest that overall students do not differ by sex or ethnicity in their perception of the importance of science. The small differences that do occur suggest that sex and ethnicity interact, i.e., the effect of sex varied by ethnicity. It will be interesting to see if this pattern of results is also found among high school students. Finally, students were asked a series of questions about sex roles which included a set on women in science. As can be seen in Table 3, within each ethnic group girls were more nontraditional than boys. The responses of Mexican-American and Anglo boys were not significantly different. Mexican-American girls were more traditional than Anglo girls for two of the three questions. Relatively few girls considered science and

career education as more appropriate for boys. However, as these girls mature, they may become more concerned about the more traditional attitudes of the boys, and, therefore, decide not to pursue science in order to avoid conflicts with their male friends. Thus, while the girls may support women in science generally, they may be unwilling to risk the social disapproval that might be expected if they were to pursue careers in science.

Some implications and recommendations for change can be drawn from this study and the previous research. First, minority students need better preparation in basic skills. Mexican Americans have high aspirations, believe school is important, and work hard in school. However, their lack of preparation impedes realizing their goals. Second, students need to be encouraged to continue taking math and science courses so that they do not limit their educational and occupational options so early. Changes in the curriculum may be necessary since the minimum required usually becomes the maximum taken. Research indicates that the link between school and adult activities may be a key to increasing students' interest and effort in various subjects. Students need to be informed of the number of math and science courses that are needed for various occupations. In particular, we need to continue stressing that by not developing basic skills in English, science and math, students are making choices that have long term consequences.

Third, the sex typing of science, math and careers in general needs to be addressed. For example, workshops and visiting scientists programs that bring students in contact with women scientists, engineers

and mathematicians need to be expanded. However, the few role models available can only reach a limited number of students. We need to be creative in finding examples of women who use science in everyday life. The role of Mexican-American women as midwives and curanderas is a particularly good example of the traditional participation of women in science that is readily available but usually overlooked. Our results indicate that in addition to providing role models the issue of sex-typing should be discussed by all students. Insofar as boys are more traditional than girls, their attitudes may become increasingly important as students enter into dating relationships. General issues related to sex-typing can be discussed without changes in the curriculum, texts, or teaching materials.

Finally, all students need more counseling about their future education and occupations. Three-quarters of these eighth grade students said that they had never talked to their counselor about their future plans for work. And yet, these students were already developing attitudes and making course decisions that will limit the options they can pursue. While visiting classrooms and administering the questionnaires, we found students who wanted to be doctors or oceonagraphers but had stopped taking math or science after one year because that was all that was required. Other students would comment that they were particularly interested in biology but did not know of any careers that they could pursue with that interest. Students need more career education because they are poorly informed about the educational requirements of various careers, the projected demand for various specialties, and the related areas they might be able to pursue without extensive changes in their educations.

The schools need to provide this counseling because parents do not have adequate information to counsel their children. Education has changed considerably since most of the parents were in school and most parents are not able to keep track of the changes in the job market. Thus, many parents rely on the schools to help students plan their educational programs and decide on occupational goals. Research indicates that parents support and encourage their children's education and ethnicity does not affect such support. Insofar as minority parents have less education, however, they may be particularly limited in providing advice regarding course decisions and the educational requirements of various occupations. Therefore, career education is particularly important for changing the educational and occupational attainments of minority students.

TABLE 1

Attitudes Toward Science Courses

Percentage of students who would take science courses if given a chance

	Anglo Females	Mexican-American Females	Anglo Males	Mexican-American Males
Yes	56%	40%	47%	45%
Probably	28%	24%	24%	26%
No	8%	19%	16%	21%
Don't Know	8%	17%	13%	8%
N =	50	63	45	61

TABLE 2

Attitudes Toward Importance of Learning Science

Importance of learning science for:	Anglo Females	Mexican-American Females	Anglo Males	Mexican-American Males
1) helping student be good at kind of work he or she expects to be doing for most of his/her life				
Very	49%	27%	26%	43%
Quite	16%	34%	28%	19%
Slightly	25%	29%	32%	28%
Not at all	10%	10%	14%	10%
2) helping student understand the world around him/her				
Very	61%	36%	37%	47%
Quite	35%	44%	37%	31%
Slightly	25%	29%	32%	28%
Not At All	0% [a]	3%	7%	7%
3) helping student make decisions when buying products				
Very	25%	15%	21%	30%
Quite	37%	42%	21%	33%
Slightly	24%	32%	30%	28%
Not At All	14%	11%	28% [a]	8%
N =	51	62	43	60

[a] Significant ethnicity effect within sex at .05 level

TABLE 3

Attitudes Toward Women in Science

Just as many women as men could be good scientists or engineers	Anglo Females	Mexican-American Females	Anglo Males	Mexican-American Males
Strongly Traditional	2%	-	2%	2%
Traditional	4%	6%	18%	10%
Nontraditional	22%	38%	44%	69%
Strongly Nontraditional	72% d	56% d	36%	19%
Girls can do as well as boys in science.				
Strongly Traditional	4%	-	2%	3%
Traditional	6%	2%	2%	5%
Nontraditional	10%	28%	53%	50%
Strongly Nontraditional	80% a,d	70% b	43%	42%
Career education for boys should have higher priority with teachers than career education for girls.				
Strongly Traditional	-	5%	2%	6%
Traditional	10%	12%	21%	34%
Nontraditional	33%	51%	47%	45%
Strongly Nontraditional	57% a	32% b	30%	15%
N =	51	64	45	62

a significant ethnicity effect within sex at .05 level
b significant sex effect within ethnicity at .05 level
c significant ethnicity effect within sex at .01 level
d significant sex effect within ethnicity at .01 level

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